

Lake Elmo Aero

Aviation Program



Flight
Maneuvers
Standardization
Manual

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LAKE ELMO AERO, LLC FLIGHT MANEUVERS STANDARDIZATION MANUAL
RECORD OF CHANGE PAGE

All Instructors are required to possess the latest edition of the FMSM. Upon receipt of revisions to the FMSM, insert the new information into your Manual and affix your signature to the signature page found below. Your signature indicates that you:

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A revision bar will extend the full length of new or revised text and/or illustrations added on new or existing pages. This Bar will be located adjacent to the applicable revised area on the outer left margin of the page. All revised pages will carry the date of the revision on the applicable page.

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NORMAL TAKEOFF AND CLIMB

REF: FAA-H-8083-3A (Airplane Flying handbook)

Objective: To safely execute a takeoff under normal conditions

1. Complete the Before Takeoff checklists
2. Center aircraft on runway centerline with nose wheel straight ahead
3. Advance the throttle smoothly forward to 2000 RPM, check engine instruments
4. Advance power to full forward
5. Maintain aircraft on centerline
6. Call out "*airspeed alive*"
7. Accelerate aircraft to 65 MPH call out "*V_R rotate*", increase control yoke back pressure to pitch up until the glare shield meets the horizon (approximately 10°) when positive rate climb and out of usable runway call out "*Positive rate – landing gear up*"
8. Accelerate to 95MPH [*V_Y Gear Up*] and climb on centerline, trim as necessary
9. At 1000' AGL, decrease pitch to establish and maintain 125 MPH cruise climb, set 25" MP and 2500 RPM
10. Execute a Traffic Pattern departure procedure
11. After leaving the traffic pattern, complete the climb checklist

IF REMAINING IN THE PATTERN

12. Accelerate to 95 MPH [*V_Y Gear Up*] and climb on centerline, trim as necessary
13. At 300' below pattern altitude turn to crosswind, set 25"MP and 2500 RPM
14. Continue climb to TPA and turn downwind, reduce power to 18" MP

Standards:

Private: Airspeed $V_Y +10/-5$

Commercial: Airspeed $V_Y \pm 5$

SHORT FIELD TAKEOFF

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To obtain maximum performance during takeoff and minimize the runway length required

1. Complete Before Takeoff checklists and set flaps to 25° (2nd notch)
2. Taxi aircraft on runway centerline utilizing all available runway and center nose wheel
3. Firmly depress the brake pedals to ensure holding the airplane in position during full power run-up
4. Advance the throttle forward to 2000 RPM, check engine instruments
5. Smoothly advance the throttle to full forward, check static power, and then release the brakes
6. Maintain directional control and runway centerline with the rudder pedals
7. Call out "*air speed alive*"
8. Accelerate aircraft to 60-65 MPH call out "*V_R rotate*"
9. Accelerate to V_X Gear Down (81 MPH), when positive rate climb on centerline, trim as necessary
10. When obstacle is clear or 50' AGL, accelerate and climb at 95 MPH [V_Y Gear Up]
11. When out of usable runway call out "*gear up*" and retract the landing gear.
 - *Note – gear horn will be audible until flaps are retracted below 25.*
12. Incrementally reduce flaps to 0°
13. At 1000' AGL, decrease pitch to establish and maintain 125 MPH cruise climb, set 25" MP and 2500 RPM
14. Climb out as normal

Standards:

Private: Airspeed +10/-5

Commercial: V_X +5/-0 K., then V_Y ±5

SOFT FIELD TAKEOFF

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To obtain maximum performance when taking off from a soft or rough surface runway.

1. Complete Before Takeoff checklists and set flaps to 25° (2nd notch)
2. Taxi toward the takeoff position with full back pressure on the yoke while using proper crosswind correction techniques
3. Without braking or stopping the airplane, smoothly and continuously apply full throttle, checking engine instruments and lifting the nose wheel clear of the runway as soon as possible.
 - *Note – Do not pitch up excessively as doing so may cause a tail strike*
4. Maintain directional control and runway centerline with the rudder pedals
5. As the aircraft's nose begins to rise, release a little pressure on the yoke so that the aircraft does not become airborne prior to achieving adequate lift.
6. As the main wheels lift off the runway, decrease pitch attitude to establish and maintain a level flight attitude while remaining in ground effect and accelerate to 85 MPH (V_x) and climb
7. When clear of obstacles, accelerate to 95 MPH (V_y)
8. When at a positive rate and out of usable runway call out "*Positive rate – gear up*" and climb on centerline, trim as necessary, slowly reduce flaps to 0°
9. At 1000' AGL, decrease pitch to establish and maintain 125 MPH cruise climb, set 25" MP and 2500 RPM
10. Climb out as normal.

Standards:

Private V_x or $V_y +10/-5$

Commercial: V_x or $V_y \pm 5$

MANEUVERING DURING SLOW FLIGHT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize changes in aircraft flight characteristics and control effectiveness at critically slow airspeeds in various configurations.

This maneuver may be done with or without flaps and gear, recover at or above 2000' AGL

1. Complete the maneuvers checklist
2. Reduce power to 15" MP then gear down below V_{LE}
3. Below V_{FE} incrementally extend flaps to 40°
4. Maintain heading
5. Maintain altitude with power (65MPH approximately 18"MAP)
6. Maintain airspeed with pitch
7. Establish airspeed at minimum airspeed, just above stall (Stall warning horn may be sounding continuously)
8. Execute climbs, descents and turns

On Recovery:

9. Apply full power while maintaining altitude
10. Reduce the flaps to 25°
11. At 85 MPH, Gear up (if down)
12. Reduce flaps to 0° while maintaining altitude (if extended)
13. Return to cruise flight: 22" MP and 2400 RPM
14. Perform cruise checklist

Standards:

Private: altitude ± 100 ft., heading $\pm 10^\circ$, bank $\pm 5^\circ$, airspeed +10/-0

Commercial: altitude ± 50 ft., heading $\pm 10^\circ$, bank $\pm 5^\circ$, airspeed +5/-0

POWER OFF STALLS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the indications of an imminent or full stall during power off situations with the flaps down, and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the maneuvers checklist and plan to recover by 2000 feet AGL
2. Reduce power to 15" MP then gear down below V_{LE} and adjust pitch to maintain altitude, trim as necessary
3. Below V_{FE} smoothly extend flaps in succession [10,25,40], maintain altitude
4. Maintain altitude until reaching 90 MPH and then establish a stabilized descent (trimmed) at entry airspeed to simulate a normal approach to landing
5. Descend 100 ft. and then reduce power to idle
6. Maintain altitude in straight flight or in turns with up to 20° bank. Airspeed will drop requiring additional back pressure to maintain altitude
7. On first indication of an imminent stall [stall horn, mushy controls, buffeting] or full stall call out "Stall"

On Recovery

8. Decrease the Angle of Attack by reducing back pressure or pushing forward on the yoke as necessary
9. Apply Full Throttle
10. Reduce flaps to 25°
11. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin
12. Establish V_X and subsequently V_Y , look for positive rate climb then Gear Up
13. During the climb, slowly reduce flaps to zero and climb to starting altitude
14. Return to cruise flight: 22" MP and 2400 RPM
15. Perform cruise checklist

Standards:

Private: Heading $\pm 10^\circ$, Bank $< 20^\circ \pm 10^\circ$.

Commercial: Heading $\pm 10^\circ$, Bank $< 20^\circ \pm 5^\circ$.

POWER ON STALLS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the indications of an imminent or full stall during power on situations and to make prompt, positive, and effective recoveries with a minimum loss of altitude.

1. Complete the maneuvers checklist and plan to recover by 2000 feet AGL
2. Reduce power to 15" MP then gear down below V_{LE} and adjust pitch to maintain altitude, trim as necessary
3. Maintain altitude until reaching 85 MPH/, then set power to 25" MP and smoothly increase pitch to approximately 20°
4. On first indication of an imminent stall [stall horn, mushy controls, buffeting] or full stall call out "*Stall*"

On Recovery

5. Decrease the Angle of Attack by reducing back pressure or pushing forward on the yoke as necessary
6. Apply Full Throttle
7. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin
8. Adjust pitch to V_Y and minimize altitude loss, look for positive rate climb then Gear Up
9. Return to cruise flight: 22" MP and 2400 RPM
10. Perform cruise checklist

Standards:

Private: Heading $\pm 10^\circ$, Bank $< 20^\circ \pm 10^\circ$.

Commercial: Heading $\pm 5^\circ$, Bank $< 20^\circ \pm 5^\circ$.

SECONDARY STALL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the effects of improper control usage inducing another stall after initiating a recovery from the stall.

This is a demonstrated flight maneuver

1. Complete the maneuvers checklist and plan to recover by 2000 feet AGL
2. Reduce Power to 15" MP then gear down below V_{LE} , (if performing a power off stall) adjust pitch to maintain altitude, trim as necessary
3. Perform a Power-Off or Power-On Stall, as directed
4. At the stall call out, "*Stall*", reduce the angle of attack to regain control effectiveness and apply full power
5. Maintain coordinated use of the ailerons and rudder to level the wings and prevent a spin
6. Immediately increase the pitch attitude to induce another (secondary) stall
7. At the stall, call out, "*Stall*", reduce the angle of attack to regain control effectiveness and ensure full power
8. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering into a spin
9. Lower the nose to the horizon
10. Adjust pitch to V_Y and minimize altitude loss, look for positive rate climb then Gear Up
11. Return to cruise flight: 22" MP and 2400 RPM
12. Perform cruise checklist

Standards:

Student will demonstrate a basic understanding of the maneuver

ELEVATOR TRIM STALL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the effects of not maintaining positive airplane control during a go-around/rejected landing.

This is a demonstrated flight maneuver.

1. Complete the maneuvers checklist and plan to recover by 2000 feet AGL
2. Reduce power to 15" MP then gear down below V_{LE} , adjust pitch to maintain altitude, trim as necessary
3. Below V_{FE} extend the flaps to 40°, adjust pitch and trim aircraft to maintain altitude
4. Maintain altitude until reaching 85 MPH, and then establish a stabilized descent to simulate a normal approach to landing
5. Descend 100 feet and, apply full throttle, allowing the airplane to roll left and the pitch to increase to V_X pitch attitude (approx. 12°) or at stall horn
6. Use enough forward yoke pressure to reduce the angle of attack and regain control effectiveness
7. Maintain coordinated use of the ailerons and rudder to level the wings
8. Adjust pitch to V_Y attitude and retract the flaps to 25°, look for positive rate climb then Gear Up, re-trim as necessary
9. Incrementally retract the flaps to 0°, re-trim as necessary
10. Return to cruise flight: 22" MP and 2400 RPM
11. Perform cruise checklist

Standards:

Student will demonstrate a basic understanding of the maneuver

CROSS-CONTROL STALL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To recognize the effects of improper control flight control technique.

This is a demonstrated flight maneuver.

1. Complete the maneuvers checklist and plan to recover by 2000 feet AGL
2. Reduce throttle to 15" MP then gear down below V_{LE} , adjust pitch and trim aircraft to maintain altitude
 - *Note – to avoid over speeding the flaps, perform this maneuver with flaps up*
3. Maintain altitude until reaching 90 MPH and then establish a stabilized descent at 90 MPH to simulate a normal, flaps up approach to landing
4. Descend 100 feet and simultaneously reduce power to idle and pick a reference point off the left or right wing tip
5. Turn towards the reference point using a 25-30° bank while:
6. Simultaneously applying excessive rudder pressure in the direction of the turn
7. Using opposite aileron to prevent over-banking while maintaining a constant 25-30° bank during the turn, and
8. Increasing elevator back-pressure to keep the nose from lowering, achieving 11-12° pitch up.
9. At imminent stall call out, "Stall", reduce pitch to regain control effectiveness, and apply full power.
 - *Note - Completion of the maneuver should occur by the 90° reference point and before full deflection of the rudder and aileron.*
10. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering a spin.
11. Adjust pitch to V_Y look for positive rate climb then Gear Up, re-trim as necessary
12. Return to cruise flight: 22" MP and 2400 RPM

Standards:

Student will demonstrate a basic understanding of the maneuver

ACCELERATED STALL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To demonstrate that the stall is a function of angle of attack, weight, and load factor, rather than airspeed.

This is a demonstrated flight maneuver.

1. Complete the maneuvers checklist and plan to recover by 2000 feet AGL
2. Reduce throttle to 15" MP and decelerate at or below maneuvering speed (V_A) adjusting pitch and trim aircraft to maintain altitude
 - *Note – Perform this maneuver flaps up*
3. Establish a 45-50° bank to the left or right
4. After the bank and turn are established, smoothly and steadily increase elevator back-pressure.
5. As the airspeed reaches 20 mph above the un-accelerated stall speed (V_{S1}), firmly increase elevator back-pressure.
6. At imminent stall (buffet):
 - a. Note the indicated airspeed, Call out, "*Stall*"
 - b. Reduce pitch to regain control effectiveness
 - c. Add power as necessary.
7. Maintain coordinated use of the ailerons and rudder to level the wings and prevent entering a spin
8. Minimize altitude loss.
9. Return to the altitude, heading, and airspeed specified.

Standards:

Student will demonstrate a basic understanding of the maneuver

STEEP TURNS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop smoothness, coordination, orientation, division of attention, and control techniques while executing high performance turns.

1. Complete the maneuvers checklist and plan to recover by 1500 feet AGL
2. Establish airspeed at 125MPH, (about 20" MP), trim as necessary
3. Choose a prominent landmark or note the heading
4. Roll into a 45° bank (private) or 50° bank (commercial) and begin a 360° turn
5. Rolling through 30°, add power as necessary to maintain altitude and airspeed
6. Begin roll out 15°-20° (half the bank angle) before the originating landmark or heading
7. Roll wings level and then,
8. Immediately roll into a 360° turn in the opposite direction
9. Return to cruise flight: 22" MP and 2400 RPM
10. Perform cruise checklist

Standard:

Private: Altitude ± 100 ft., Airspeed ± 10 , Bank $\pm 5^\circ$, Heading $\pm 10^\circ$.

Commercial: Altitude ± 100 ft., Airspeed ± 10 , Bank $\pm 5^\circ$, Heading $\pm 10^\circ$

CHANDELLES

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the pilot's coordination, orientation, planning, and feel for maximum performance flight, and to develop positive control techniques at varying airspeeds and attitudes.

1. Complete the maneuvers checklist and plan to recover by 1500 feet AGL
2. Establish airspeed at 125MPH (about 20" MP), trim as necessary
3. Select a reference point directly off the left or right wing tip
4. Roll into a coordinated 30° bank turn and neutralize rudder and aileron.
5. After the bank is established, smoothly initiate a climb and apply full power.
6. While maintaining a 30° bank, continue increasing the pitch attitude at a constant rate so as to attain the highest pitch (approx. 13-15°) at the 90° point in the turn
7. At the 90° point in the turn, maintain a constant pitch attitude by continuing to increase elevator backpressure (due to decreasing airspeed) and initiate a slow rate of rollout
8. Maintain a constant roll out rate with aileron while increasing right rudder and increasing back pressure to maintain pitch, plan to decrease bank 10° by 30° of heading change
9. Arrive at the 180° point with airspeed about 5 MPH above stall, wings level, and coordinated flight. Maintain pitch for about 3 seconds.
10. Begin slowly decreasing pitch attitude to level flight and increasing airspeed. No altitude loss.
11. Return to cruise flight: 22" MP and 2400 RPM
12. Perform cruise checklist

Standards:

Commercial: Airspeed just above stall, Heading $\pm 10^\circ$

LAZY EIGHT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the pilot's feel for varying control forces, and the ability to plan and remain oriented while maneuvering the plane with positive and accurate control.

1. Complete the maneuvers checklist and complete the maneuver by 1500 feet AGL
2. Select a forced landing area and set Airspeed to 125 (about 20" MP), trim as necessary.
3. Select 45°, 90°, and 135 °reference points on or out toward the horizon
4. From straight and level flight, initiate a shallow climbing turn by simultaneously increase bank and pitch slowly planning to achieve maximum pitch (approx. 13°-15°) and 15° bank angle at the 45° reference point. If the turn is to the left, a slight amount of right rudder and neutral aileron will be required to maintain coordination. If the turn is to the right, more right rudder will be required and slight opposite aileron at the 45° reference to prevent over-banking
5. From the 45° reference point allow the bank angle to continue increasing, and pitch to decrease so that at the 90° reference point the maximum bank angle (30°) is achieved and the pitch attitude is passing through level flight at minimum airspeed
6. From the 90° reference point, allow the pitch attitude to continue decreasing and initiate a slow decrease in bank angle while continuing a descending turn in the direction of the 135° reference point where the maximum pitch down attitude (approx. 13°-15°) should be achieved with a 15° bank angle
7. From the 135° reference point, continue decreasing the bank angle while allowing the pitch to increase so that the airplane returns to the entry airspeed and altitude by the 180° reference point
 - Note – The airspeed should not exceed the entry airspeed during the turn from the 90 Degree reference point to the 180 Degree reference point.
8. Proceed through the 180° point with no hesitation and begin a shallow climbing turn in the opposite direction, repeating the steps outlined above
9. Complete the maneuver at entry heading, airspeed and altitude
10. Return to cruise flight: 22" MP and 2400 RPM
11. Perform cruise checklist

Standards:

Commercial: Bank angle $\leq 30^\circ$, Altitude ± 100 ft., Airspeed ± 10 MPH
Heading $\pm 10^\circ$.

STEEP SPIRAL

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To improve pilot technique for airspeed and wind drift control, planning, orientation, and division of attention.

1. Complete the maneuvers checklist
2. Determine wind direction
3. Establish an altitude that will allow at least 3 -360° turns, rollout before 1500' feet AGL
4. Select a forced landing area where an emergency landing can be made if necessary
5. Approach a prominent reference point to spiral around so as to enter on downwind
6. Close throttle and adjust pitch to establish and maintain best glide speed (105 MPH), trim as necessary
7. Maintain a constant radius around the reference point adjusting the bank angle as necessary not to exceed 60°
 - *Note – Prolonged idle power may result in excessive engine cooling or spark plug fouling, especially during cold weather. The engine should be cleared periodically by briefly advancing the throttle to 18" MAP. This should be done with a headwind to minimize groundspeed variation*
8. Complete at least three 360° turns
9. Complete the maneuver on entry heading
 - *Note – Recover no lower the 1500' AGL unless combining the maneuver with a simulated Emergency Approach and Landing*
10. Return to cruise flight: 22" MP and 2400 RPM
11. Perform cruise checklist

Standards:

Commercial: Bank angle $\leq 60^\circ$, Altitude sufficient to complete three 360°,
Airspeed ± 10 MPH, Heading $\pm 10^\circ$

EMERGENCY DESCENT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To descend the airplane as rapidly as possible, within the operating limitations of the airplane. This is a demonstrated maneuver and not an actual emergency descent. To complete an actual emergency descent, see the emergency checklist

1. Complete the maneuvers checklist and roll out by 1500 feet AGL
2. Brief all passengers
3. Pick a visual landmark off the wing tip in the direction of turn
4. Throttle to Idle, propeller RPM maximum, gear down below maximum gear extension speed (V_{LE}).
5. Simultaneously roll into a 30°-45° bank in direction of planned turn and adjust pitch to maintain 10 MPH below V_{LE} .
6. Approaching the target altitude, begin to level off by increasing pitch to reduce the descent rate
7. At target altitude, adjust pitch to maintain level flight
8. Return to cruise flight and set Cruise power 22" MP and 2400 RPM
9. Perform cruise checklist

Standards:

Private: Airspeed, establishes appropriate airspeed, Maintains positive load factors during the descent

Commercial: Airspeed \pm 10 MPH, Maintains positive load factors during the descent, Altitude, \pm 100 feet

EMERGENCY APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)
Piper Warrior Pilot's Operation Manual (POH)

Objective: To execute a safe approach and landing in the event of an engine failure

NOTE

When simulating an engine failure, the Instructor Pilot will call out "Simulated Engine Failure" to ensure the student knows how to respond

1. Establish the best glide speed V_G 105 MPH, trim as necessary
2. Determine wind direction and select a suitable landing site, checking the area in the immediate vicinity of the aircraft's position
3. Turn the airplane towards the selected landing site
4. Go through the Engine Failure in Flight Memory Items Checklist
5. If altitude permits, complete the emergency checklist
6. If engine restart is unsuccessful, maneuver the aircraft as necessary for the approach and landing
7. Squawk transponder code 7700 and transmit mayday on 121.5

NOTE

Prolonged idle power may result in excessive engine cooling or spark plug fouling, especially during cold weather. The engine should be cleared periodically by briefly advancing the throttle to cruise power.

How to maneuver the aircraft for the pattern and the approach and landing will depend on many variables, including location of the closest suitable landing site to the aircraft's current position, altitude, wind direction, landing direction, obstructions, etc. All variables must be considered when developing a maneuvering plan

8. When appropriate, maneuver the aircraft to arrive at a point abeam the point of intended landing at 1000' AGL
9. Turn onto the base leg and determine if adjustment of the flight path of the base leg is necessary to conserve or dissipate altitude to ensure reaching the desired landing point
10. Complete the Power Off Landing checklist:

NOTE

Unless the approach is made to an airport runway, the simulated emergency approach and landing should be terminated as soon as it can be determined that a safe landing could have been made, or 500' AGL, whichever occurs first

Standards:

Private: Best Glide ± 10 MPH
Commercial: Best Glide ± 10 MPH

RECTANGULAR COURSE

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Complete the maneuvers checklist
2. Determine the wind direction
3. Perform Clearings turns and plan to execute the maneuver between 600-1000 feet AGL
4. Select a forced landing area
5. Establish and maintain speed at 125MPH (about 20" MP), trim as necessary
6. Enter either left or right pattern on a 45° angle to the mid-field downwind leg
7. Establish a crab angle as necessary to maintain a uniform distance from the area boundaries for each leg of the maneuver
 - *Note – The airplane should be flown parallel to and at a uniform distance ¼ to ½ mile away from the field boundaries*
8. Begin the turn to next leg when airplane is abeam the corner of the area boundary
9. Vary the bank angle (not to exceed a 45° bank) to maintain a constant radius during the turns
10. Depart on a 45° from the downwind at the downwind turn boundary
11. Return to cruise flight: 22" MP and 2400 RPM
12. Perform cruise checklist

Standards:

Private: Airspeed ± 10 MPH, Altitude ± 100

S-TURNS ACROSS A ROAD

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To teach the student to maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane

1. Complete the maneuvers checklist
2. Determine the wind direction
3. Perform clearing turns and maneuver must be executed between 600-1000 feet AGL
4. Pick an area that includes an emergency landing field
5. Establish and maintain speed at 125MPH (about 20" MP), trim as necessary
6. Enter on a downwind heading
7. When directly over a reference line or road (highest groundspeed), roll into the steepest bank (not to exceed 45°) to initiate and maintaining a constant radius
8. As the turn continues (groundspeed decreases), begin to shallow the bank as necessary to continue maintaining a constant radius
9. Level the wings when crossing the reference point (lowest groundspeed) and immediately begin a turn back in the opposite direction
10. As the turn continues (groundspeed increases), begin to steepen the bank as necessary to continue maintaining a constant radius
11. Level the wings when crossing the reference point (highest groundspeed)

NOTE

The rollouts must be timed in order to be straight and level directly over and perpendicular to the reference line or road

12. Return to cruise flight: 22" MP and 2400 RPM
13. Perform cruise checklist

Standards:

Private: Airspeed ± 10 MPH., Altitude ± 100 ft.

TURNS AROUND A POINT

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Complete the maneuvers checklist
2. Determine the wind direction
3. Perform Clearings turns and plan to execute the maneuver between 600-1000 feet AGL
4. Select a forced landing area
5. Establish and maintain speed at 125MPH (about 20" MP), trim as necessary
6. Enter the maneuver at cruise speed on downwind to one side of the selected reference point at a distance equal to the desired radius of turn
7. On entry downwind (highest groundspeed) and abeam the reference point, roll into the steepest bank (not to exceed 45°) to initiate and maintain a constant radius
8. As the turn continues (groundspeed decreases), begin to shallow the bank as necessary to continue maintaining a constant radius
9. Directly upwind (lowest groundspeed), the bank should be at its shallowest
10. As the turn continues (ground speed increases), begin to steepen the bank as necessary to continue maintaining a constant radius
11. Complete two complete circles, or as directed, and depart on the entry heading
12. Return to cruise flight: 22" MP and 2400 RPM
13. Perform cruise checklist

Standards:

Private: Airspeed ± 10 MPH., Altitude ± 100 ft.

EIGHTS ON PYLONS

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To maneuver the airplane over a predetermined ground path while dividing attention inside and outside the airplane.

1. Complete the maneuvers checklist
2. Determine the wind direction
3. Perform clearing turns and determine the pivotal altitude

NOTE

To determine the pivotal altitude, use the following calculation:

$$\text{Pivotal Altitude} = \frac{(\text{GS Knots})^2}{11.3} \quad \frac{(\text{GS MPH})^2}{13}$$

4. Select a forced landing area that will allow an emergency landing from any position in the maneuver
5. Establish and maintain an entry speed at 125MPH (about 20" MP), trim as necessary
6. Enter the maneuver on a 45° to the downwind and at a distance from the pylons that will require up to 30° angle of bank at the steepest point
7. At the position where the pylon appears to be just ahead of a line extending from the pilot's eye and parallel to the airplane's lateral axis, lower the upwind wing to place the pilot's line of sight on the pylon
8. As the turn is continued, the groundspeed of the airplane will decrease as the wind changes from a tailwind to a crosswind. To keep the pylon on the reference line, the pilot must lower the altitude by pitching down. As the airplane continues to turn, the wind changes to a headwind, ground speed decreases, requiring a lower pivotal altitude to maintain the reference line on the pylon. The pilot adjusts by pitching down if necessary

NOTE

The effects of the wind on the airplane's groundspeed should be anticipated so as to smoothly adjust pitch, where necessary, to maintain the line of sight reference with the pylon

9. As the airplane turns toward a downwind heading, plan to roll out to maintain a 45° ground track across the road /section line in straight and level flight for 3 to 5 seconds
10. Lead the roll in on the second pylon as in the first and maintain the reference point with pitch changes to continue the maneuver
11. Maintain division of attention away from the ground reference point to continue collision avoidance as well as inside the airplane to check flight instruments for accuracy and engine instruments for proper operation

Standards:

Commercial: Maximum bank angle 30-40°.

NORMAL APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To safely and accurately establish and maintain a stabilized approach to a landing in a designated area.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 18" MP, gear down at mid-field and perform BCGUMPS check
4. Abeam the point of intended landing, reduce throttle to 15" MP
5. Below V_{FE} extend flaps to 10°
6. Maintain 110 MPH and 300-500 ft./min descent
7. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
8. Extend flaps to 25° and slow the aircraft to 100 MPH
9. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
10. When turning final, extend flaps to 40° establish and maintain 90 MPH (+1/2 gust factor if appropriate). Trim as necessary

NOTE

The approach must be stabilized by 500 feet. If not, execute a go-around

11. Approaching the runway, reduce power so as to cross the threshold of the runway at 85MPH (+1/2 the gust factor if appropriate)
12. At the round out, commence reducing power to idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling gently
13. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

Standards:

Private: Airspeed +10/-5 MPH. Touch Down: 400 ft.

Commercial: Airspeed ± 5 MPH. Touch Down 200 ft.

SHORT FIELD APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To safely and accurately establish and maintain a stabilized approach to a landing, obtaining maximum performance by stopping in a minimum distance.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 18" MP, gear down at mid-field and perform BCGUMPS check
4. Abeam the point of intended landing, reduce throttle to 15" MP
5. Below V_{FE} extend flaps to 10°
6. Maintain 110 MPH and 500 ft./min descent
7. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
8. Extend flaps to 25° and slow the aircraft to 100 MPH
9. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
10. Ensure a steeper than normal approach for obstacle clearance (if necessary). Once the correct angle is established, reduce power to just above idle to fly the steeper approach.
11. When turning final, extend flaps to 40° establish and maintain 90MPH (+1/2 gust factor if appropriate).

NOTE

The approach must be stabilized by 500 feet. If not, execute a go-around

12. Before the roundout, begin smoothly reducing power so as to cross the threshold at 85MPH, continuing the power reduction during the roundout while increasing pitch to maintain a constant glide path to the desired touchdown point

NOTE

Avoid closing the throttle rapidly, which may result in an immediate increase in the rate of descent and a hard landing

13. Touch down at minimum controllable airspeed, with the throttle at idle position, on the main wheels first, plan for minimum float
14. Immediately after touchdown, apply maximum aerodynamic braking
15. Applying heavy braking when nose wheel is on runway.

Standards:

Private: Airspeed +10/-5 MPH. Within 200 ft. of intended landing point

Commercial: Airspeed ± 5 MPH. Within 100 ft. of intended landing point

SOFT FIELD LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the student's ability to safely and accurately maintain a stabilized approach to land the airplane obtaining maximum performance by touching down at the slowest possible airspeed.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at traffic pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 18" MP, gear down at mid-field and perform BCGUMPS check
4. Abeam the point of intended landing, reduce throttle to 15" MP
5. Below V_{FE} extend flaps to 10°
6. Maintain 110 MPH and 500 ft./min descent
7. When the touchdown point is 45° to the rear of the wing root (or as appropriate for wind conditions), commence a turn to the base leg
8. Extend flaps to 25° and slow the aircraft to 100 MPH
9. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
10. When turning final, extend flaps to 40° establish and maintain 90 MPH (+1/2 gust factor if appropriate). Trim as necessary

NOTE

The approach must be stabilized by 500 feet. If not, execute a go-around

11. At the round out, commence reducing power as necessary so as to cross the threshold at 85MPH and initiate the flare to hold the airplane 1-2 feet off the surface in ground effect as long as possible to gradually dissipate forward speed, Power may be used to slow the rate of descent and soften the touchdown.
12. Touchdown on the main wheels first holding the nose wheel off with back pressure throughout the rollout
13. Taxi off runway without stopping and with the use of little or no brakes.

NOTE

Conduct all taxi operations with the control wheel fully aft. On softer surfaces, additional power may be needed to maintain taxi speed and to avoid becoming stuck. Avoid the use of brakes to prevent imposing a heavy load on the nose gear, causing the nose gear to "dig" into the soft surface.

Standards:

Private: Airspeed +10/-5 MPH

Commercial: Airspeed \pm 5 MPH

POWER-OFF 180° ACCURACY APPROACH AND LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To demonstrate the judgment, technique, and skill necessary for accurately flying the airplane, without power, to a safe landing.

1. Complete the Landing Checklist
2. At least 2 nm from the runway, enter the traffic pattern at pattern altitude on a 45° entry to the downwind, maintaining ½ mile distance from the runway on the downwind leg
3. Set power to 18" MP, gear down at mid-field and complete BCGUMPS check
4. Abeam the point of intended landing, reduce throttle to idle, slowing to 105 MPH and commence a descent. Trim as necessary
5. At a point appropriate for wind conditions, commence a turn to the base leg using a medium to steep bank angle (20°-30°)

NOTE

Establish and then adjust the base leg toward, perpendicular, or away from the intended touchdown point, considering altitude and wind conditions, so as to conserve or dissipate altitude as necessary to reach the intended touchdown point

6. On base leg, add flaps as necessary and maintain descent speed. The base leg is not a fixed point on the ground and may be adjusted to accommodate varying conditions
7. Visually verify that the final approach (including the extended final and the opposite base leg) is clear, and then turn to final
8. When landing is assured, extend flaps to 40° establish and maintain 85 MPH (+1/2 gust factor if appropriate). Trim as necessary

NOTE

The approach must be stabilized by 200 feet. If not, execute a go-around

9. At the round out, leave the power at idle, continuing the flare to touch down on the main wheels first, holding the nose wheel off with back pressure throughout the rollout; allow settling gently
10. Maintain directional control throughout the rollout, slowing sufficiently before turning onto a taxiway

Standards:

Commercial: Airspeed ± 5 MPH, within 200 ft. of intended touchdown point

GO-AROUND/REJECTED LANDING

Ref: FAA-H-8083-3A (Airplane Flying Handbook)

Objective: To develop the ability to safely transition at a critical time from the approach and landing phase to the climb.

1. Upon deciding to go-around:
 - a. Power full forward
 - b. Pitch up slightly
 - c. Flaps reduce to 25° immediately
 - d. Positive rate, gear up
 - e. Climb at 85 MPH(V_x)
 - f. Obstacle cleared – flaps up incrementally
 - g. Accelerate to 95MPH (V_Y)
2. Maintain directional control and proper wind-drift correction throughout the climb
3. Execute an appropriate departure procedure, or remain in the traffic pattern as appropriate
4. Complete the Go Around Checklist

Standards:

Private: Airspeed +10/-5 MPH

Commercial: Airspeed \pm 5 MPH

ARROW V SPEEDS

		<u>PA-28R-200</u>
Rotation (V_R)		65 MPH
Best Rate of Climb (V_Y)	Gear Down	85 MPH
	Gear UP	95 MPH
Best Angle of Climb (V_X)	Gear Down	81 MPH
	Gear Up	91 MPH
Stall Speed Flaps (V_{S0})		64 MPH
Stall Speed Clean (V_{S1})		70 MPH
Maneuvering Speed (V_A)		134 MPH
Flaps Extended Speed (V_{FE})		125 MPH
Max. Gear Extend		150 MPH
Max Gear Retract		125 MPH
Normal Operating Speed (V_{NO})		170 MPH
Never Exceed Speed (V_{NE})		214 MPH
Best Glide		105 MPH
Cruise Climb		125 MPH

Speeds are for an aircraft operating at gross weight

PA-28R-200

1.3 V_{S0} = 85 MPH

Flap extended positions	10, 25, 40 degrees
Max Demonstrated Crosswind Component	20 MPH
Max Gross Weight	2600
Standard Empty Weight	1531
Engine Manufacturer	Lycoming
Model	IO-360
Type	C1C and C1C6
Displacement	360 Cubic Inches
Horsepower	200 HP
Rated Speed (RPM)	2700 RPM
Oil	Max 8 qts
	Min 6 qts
Prop Length	74 Inches
Wing Span	32.2 Feet
Fuel	Grade 100LL (Blue)
	Quantity 48 Gal. Usable \ 2 Gal. Unusable
Tire Pressure	
	Main 27 PSI
	Nose 30 PSI

Electrical System

Battery	12 Volts; 25 Amp Hour
Alternator	14 Volts; 60 Amps

There is an ammeter that measures the electrical load on the alternator.

Fuel System

There are 48 gallons of usable fuel and 2 gallons of unusable fuel, which gives us a total of 50 gallons. There is one engine driven fuel pump and one electric fuel pump in the event of engine driven fuel pump failure.